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ABSTRACT

In spite of a mandate to create educational equality, the Kentucky Education Reform Act (KERA) has not eliminated inequalities in school performance scores, and the problem may even be getting worse. The objective of this study is to determine the disparities that exist among Kentucky's eight Service Center regions. The analysis uses school Academic Index scores from 1992-93 to 1996-97, averaged by region. The regional averages (or means) are compared descriptively along with the statistical application of pairwise multiple comparisons. The study's findings show that regional disparities in Academic Index scores clearly exist. These disparities are probably the result, at least in part, of contextual effects such as rural-metropolitan differences and socioeconomic influences. A goal of the KERA should be to narrow the gap between the schools in different regions. To assess progress toward this goal, it will be useful to monitor disparities in the gains that regions achieve in their scores over time. This analysis indicates that, after 5 years of KERA performance records, schools in the eight Service Regions have generally kept pace with one another. Although greater equality is still an unrealized ideal under KERA, improvement has taken place, and there is little evidence of a widening gap between higher- and lower-scoring regions. Another 5 years of data should tell if a widening gap between regions has become a problem. (Contains 2 figures, 4 tables, and 11 references.) (SLD)

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Executive Summary

REGIONAL DISPARITIES IN KENTUCKY ACADEMIC INDEX SCORES

Recent newspaper articles by columnist Bill Bishop in the Lexington Herald-Leader point to persistent regional disparities in achievement in Kentucky public schools. In spite of a mandate to create educational equality, the Kentucky Education Reform Act (KERA) has not eliminated inequalities in school performance scores and the problem may even be getting worse according to Mr. Bishop. The objective of the present study is to determine what disparities exist among Kentucky's eight Service Center Regions. The analysis uses school Academic Index scores, from 1992-93 to 1996-97, averaged by region. The regional averages (or means) are compared descriptively along with the statistical application of pairwise multiple comparisons.

The study's findings show that regional disparities in Academic Index scores clearly exist. These disparities are probably owing, at least in part, to contextual effects such as rural-metropolitan differences and socioeconomic influences. A goal of KERA should be to narrow the gap between the schools in different regions. To assess the accomplishment of this goal, it will be useful to regularly monitor disparities in the *gains* that regions achieve in their scores over time. The present analysis concludes that after five years, schools in the eight Service Regions have generally kept pace with one another. Thus, although greater equality is still an unrealized ideal under KERA, improvement has taken place with little evidence thus far of a "widening gap" between the higher- and lower-scoring regions. Another five years of data should tell if a widening gap between the regions has become a persistent problem.

Introduction

Recently, Lexington Herald-Leader columnist Bill Bishop pointed to persistent regional disparities in Kentucky schools, despite the State's comprehensive program of educational reform. In a February 15, 1998 column entitled "Equality Was Heart of Reform," Bishop (1998a) reported that the schools in Service Region 8 (Pikeville/Hazard/Prestonsburg, etc.) score lower than do schools in the other regions. Furthermore, Bishop noted that Region 8 schools are "falling behind the rest of the state."[1] A March 1, 1998 column by Mr. Bishop (1998b) charges that due to 60 years of neglect "Eastern Kentucky has an accumulated education deficit."[2] It is this deficit that accounts for the area's lack of economic and social development today.[3]

Mr. Bishop has put his finger on an important issue. The Kentucky Education Reform Act of 1990 (KERA) was founded on the ideal that all children of the Commonwealth should have equal educational opportunities. KERA is now in its seventh year, and five years of school performance data have been accumulated. It is not too early to begin assessing if the ideal of equality is being realized.

The present study examines regional achievement in school Academic Index scores for the five-year period, from 1992-93 to 1996-97. The analysis makes a distinction between: (1) differences in scores that show which regions on average have scored higher and which have

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[1]Bishop (1998c) has repeated these views in an April 26, 1998 column.

[2]The area referred to in this article includes Service Region 7 (Ashland/Maysville/Morehead, etc.), Region 8 (Pikeville/Hazard/Prestonsburg, etc.), and part of Region 6 (Richmond/London/Williamsburg, etc.).

[3]Greenberg and Teixeira (1995), Brint (1998), and others have disputed the claim that there is a simple, direct relationship between the educational status of the population and economic development.

scored lower, and (2) changes in a region's scores over time compared with the changes in other regions. Thus, the objective of the study is to find out what disparities in educational performance exist among Kentucky's eight Service Center Regions (FIGURE A).

Methodology

Using Academic Index scores from 1992-93 to 1996-97,[4] an annual average score of the schools in each region was obtained to document regional trends. Next, a 5-year mean was calculated for each of the eight regions. Then, differences between the regions were analyzed descriptively and with a pairwise multiple comparison of the means. A further analysis identified regions that have achieved statistically-determined greater or lesser gains in their average school scores. A problem arose at this juncture. The graph in FIGURE B (which is derived from TABLE 1 below) illustrates the nature of the problem. The graph traces the overall Kentucky average test scores by year, from 1992-93 to 1996-97, and also displays the annual scores of two below-average regions, Region 3 (Louisville/Jefferson Co., etc.) and Region 8 (Pikeville/Hazard/ Prestonsburg, etc.). For visual comparison the graph shows the trend in scores of the highest performing region in the State, Region 5 (Lexington/Frankfort/Winchester, etc.). As FIGURE B

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[4]The 1992-93 to 1995-96 data were obtained from the corrected Cycle 2 results. The 1996-97 (Cycle 3) data were then merged with these previously available data by matching school names. The merging of these two data sets posed a problem since the 1996-97 data set includes scores not recorded in the previous data set as well as joint school scores. Joint schools are one or more schools that have been combined with another school for accountability purposes because the school does not contain both a 4th and 5th grade or both a 7th and 8th grade. Joint schools are the result of the expansion of testing at grades 5 and 7, which began in 1996-97. Each joint school has a combined record ard an individual school record for the schools that comprise the joint school. In the present study, care was taken to expunge the joint school records. Only the scores of individual schools were used. A missing values analysis found very slight differences in the means and standard deviations of the listwise values used in this study compared with the means and standard deviations of all values available for each year.

Figure A
SERVICE CENTER REGIONS

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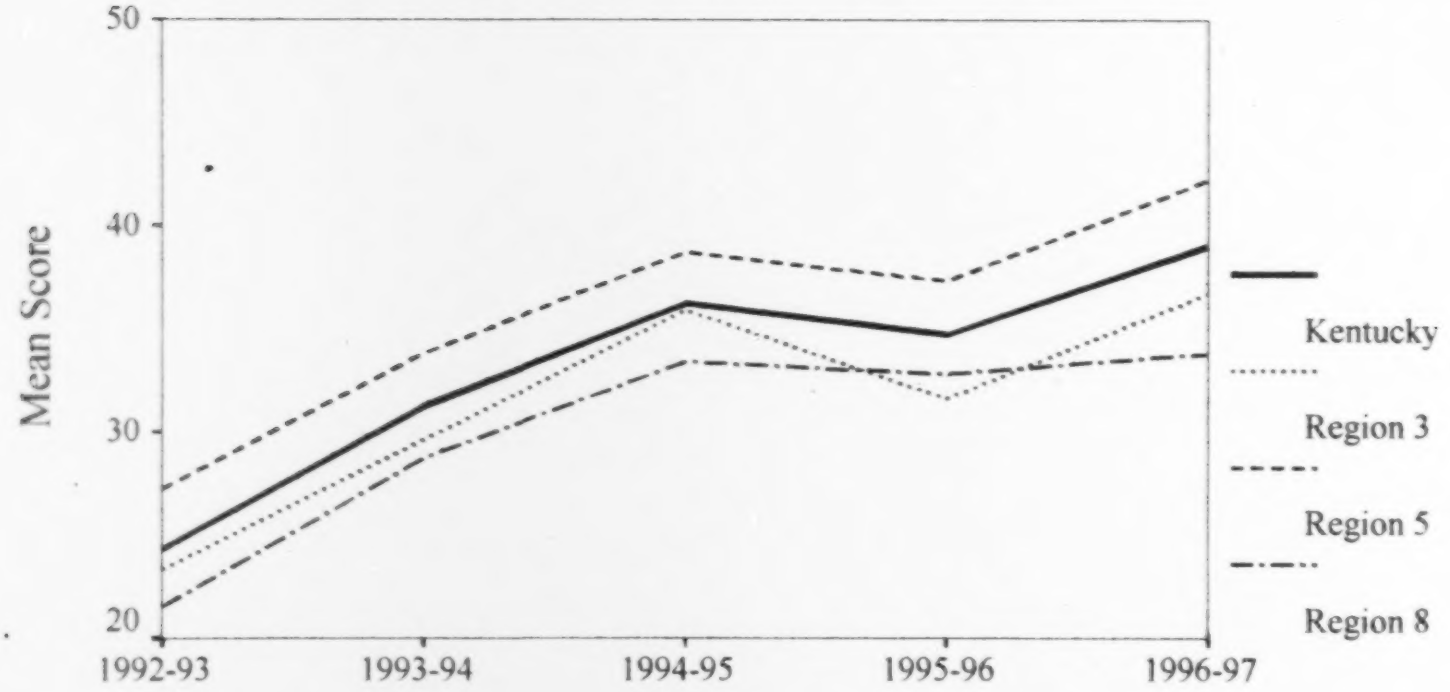
FIGURE B

ACADEMIC INDEX SCORES FOR KENTUCKY

AND SELECTED REGIONS, BY SCHOOL YEAR



illustrates, the statewide average score increased during the first three years, declined in the fourth year, and increased again in the fifth year. The present study will not attempt to explain why this kink in the trend occurred.

The trend of Region 5 (Lexington/Frankfort/Winchester, etc.) has a shape similar to the Kentucky trend, although the Region 5 mean score is 2-3 points higher than the State average in each year. In contrast with this, the trend of Region 8 (Pikeville/Hazard/Prestonsburg, etc.) lies beneath the Kentucky trend. Region 8 mean scores are 2-3 points less than the State averages until the final year, 1996-97, when the trend flattens and the mean score of this region drops to 5 points below the State average. Region 3 is near the State average for the first three years then drops below Region 8 in 1995-96 before recovering in the fifth year. How should changes in the scores be interpreted given these trends? The simple approach would be to compare the difference in school scores between 1992-93 and 1996-97, averaged for each of the eight regions.[5] But, when this procedure is used, Region 8 registers a negligible increase from 1995-96 to 1996-97. As a result it has a significantly lower 5-year gain when compared with most of the other regions (see below, TABLE 4, upper figures). This result, however, is due entirely to the comparatively slight gain in 1996-97. If the difference were calculated between 1992-93 and 1995-96, for example, Region 8 would have registered greater improvement than Region 3, and the gain in Region 8 would not deviate significantly from the gains achieved by the other regions.[6]

The lesson here is that the comparison of region-to-region gains in scores when based on

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[5]This is the procedure that Bishop (1998c) follows in his April 26, 1998 column. His analysis focuses on mathematics scores, whereas the analysis in the present study uses the total Academic Index score.

[6]This analysis is not presented here but will be provided on request.

the differences between single-year scores can produce misleading results. To demonstrate this more comprehensively, two approaches to analyzing changes in the scores were used in this study. First, the simple approach just described which compares the difference between the first- and fifth-year scores was used. Since this approach does not control the volatility of single-year scores, it can exaggerate disparities (and similarities) between the regions. The second approach was to subtract the average of the first two years from the average of the fourth and the fifth years to obtain a measure of change. In other words, for each region, the 1992-93 and 1993-94 scores were averaged and subtracted from the average of the 1995-96 and 1996-97 scores. Compared to the first approach, this yields less volatile estimates of regional gains by smoothing out fluctuations in the differences between the first- and the last-year scores.

Findings

TABLE 1 displays the 5-year trends in the average Academic Index scores for the eight Service Center Regions. The trend for the entire State went as follows: In 1992-93, the score was 24.3. By 1994-95, it had increased to 36.2. Then in the following year, 1995-96, the score declined to 34.7, before increasing to 39.0 in 1996-97. Across the 5-year period, the scores for the entire State gained 14.7 points. The trends in TABLE 1 also reveal that Region 5 (Lexington/ Frankfort/Winchester, etc.) is consistently the highest-scoring region and Region 8 (Pikeville/ Hazard/Prestonsburg, etc.) is consistently the lowest-scoring region. Region 7 (Ashland/ Maysville/Morehead, etc.) registered scores that most closely approximate the entire State averages. A clearer picture of the differences between the regions emerges by averaging these trends.

TABLE 1

REGIONAL AVERAGES OF SCHOOL ACADEMIC INDEX
SCORES FROM 1992-93 TO 1996-97

School Years / Regions of the State	1992-93	1993-94	1994-95	1995-96	1996-97
Region #1 (Paducah/Henderson/Murray, etc.)	24.6	31.1	37.4	34.8	40.7
Region #2 (Bowling Green/Owensboro/ Elizabethtown, etc.)	25.0	31.9	36.7	36.0	41.8
Region #3 (Louisville/Jefferson Co., etc.)	23.3	29.6	35.9	31.6	36.7
Region #4 (Covington/Newport/Dayton, etc.)	25.8	34.3	38.0	36.4	41.6
Region #5 (Lexington/Frankfort/Winchester, etc.)	27.2	33.8	38.7	37.3	42.2
Region #6 (Richmond/London/Williamsburg, etc.)	22.8	29.7	34.4	33.3	36.4
Region #7 (Ashland/Maysville/Morehead, etc.)	24.9	30.6	35.9	34.7	39.6
Region #8 (Pikeville/Hazard/Prestonsburg, etc.)	21.5	28.7	33.4	32.8	33.8
Entire State	***24.3***	***31.2***	***36.2***	***34.7***	***39.0***

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TABLE 2 displays the means and standard deviations of the school scores after they were averaged for the 5-year period and broken down by Service Region. The data also reflect the lowest and highest scores posted for schools in each region. Region 5 (Lexington/Frankfort/ Winchester, etc.) has the highest mean score (M = 35.9), while Region 8 (Pikeville/Hazard/ Prestonsburg, etc.) has the lowest mean score (M = 30.0). Region 1 (Paducah/Henderson/ Murray, etc.), Region 2 (Bowling Green/Owensboro/Elizabethtown, etc.), Region 4 (Covington, Newport, Dayton, etc.), Region 5 (Lexington/Frankfort/ Winchester, etc.), and Region 7 (Ashland/Maysville/Morehead, etc.) have mean scores that equal or exceed the State average. Region 3 (Louisville/Jefferson Co., etc.), Region 6 (Richmond/London/Williamsburg, etc.), and Region 8 (Pikeville/Hazard/Prestonsburg, etc.) fall below the State average. The school with the lowest average level of performance for the 5-year period (M = 15.8) was in Region 3 (Louisville/ Jefferson Co., etc.). Region 5 had the school with the highest average level of performance (M = 70.5) during the same span of years.

The descriptive data in TABLE 2 clearly suggest regional disparities, but they do not tell which regions had significantly lower or higher levels of school performance than another. A pairwise multiple comparison of the regional means is needed to find this out.[7] Looking at the negative differences (TABLE 3), Region 3 scores significantly lower than either Region 4 or Region 5 (the mean differences are -3.8 and -4.4 respectively). Region 6 scores lower than four other regions--Regions 1, 2, 4, and 5, while Region 8 scores lower than these same four regions and also lower than Region 7. Clearly, by this analysis, Region 6 and Region 8 on average have

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[7]Since the variances were unequal, this analysis employed the statistical application of Tamhane's T2 method of testing the pairwise multiple comparison of the group means.

TABLE 2

SCHOOL ACADEMIC INDEX SCORES AVERAGED BY REGION
FROM 1992-93 TO 1996-97

Descriptive Measures / Regions of the State	Number of Schools (N)	Regional Mean Score (M)	Standard Deviation (SD)	Within-Region Range	
				Lowest School Score	Highest School Score
Region #1 (Paducah Henderson Murray, etc.)	135	33.7	5.6	20.1	47.2
Region #2 (Bowling Green Owensboro Elizabethtown, etc.)	154	34.3	5.8	18.2	52.7
Region #3 (Louisville Jefferson Co., etc.)	108	31.4	8.4	15.8	54.8
Region #4 (Covington Newport Dayton, etc.)	137	35.2	7.3	16.0	60.4
Region #5 (Lexington Frankfort Winchester, etc.)	154	35.9	7.9	18.1	70.5
Region #6 (Richmond London Williamsburg, etc.)	179	31.3	6.4	19.9	52.8
Region #7 (Ashland Maysville Morehead, etc.)	100	33.1	6.7	20.6	58.2
Region #8 (Pikeville Hazard Prestonsburg, etc.)	163	30.0	5.7	19.0	53.0
(ENTIRE STATE)	*1,130*	*33.1*	*7.0*	*15.8*	*70.5*

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TABLE 3

COMPARISONS OF AVERAGE REGIONAL DIFFERENCES IN SCHOOL ACADEMIC INDEX SCORES FROM 1992-93 TO 1996-97

Regions of the State	Region #1	Region #2	Region #3	Region #4	Region #5	Region #6	Region #7	Region #8
Region #1 (Paducah Henderson Murray, etc.)	---	---	---	---	---	2.4	---	3.7
Region #2 (Bowling Green Owensboro Elizabethtown, etc.)	---	---	---	---	---	3.0	---	4.2
Region #3 (Louisville Jefferson Co., etc.)	---	---	---	(-3.8)	(-4.4)	---	---	---
Region #4 (Covington Newport Dayton, etc.)	---	---	3.8	---	---	3.9	---	5.2
Region #5 (Lexington Frankfort Winchester, etc.)	---	---	4.4	---	---	4.6	---	5.8
Region #6 (Richmond London Williamsburg, etc.)	(-2.4)	(-3.0)	---	(-3.9)	(-4.6)	---	---	---
Region #7 (Ashland Maysville Morehead, etc.)	---	---	---	---	---	---	---	3.1
Region #8 (Pikeville Hazard Prestonsburg, etc.)	(-3.7)	(-4.2)	---	(-5.2)	(-5.8)	---	(-3.1)	---

NOTE: For emphasis negative figures are enclosed by parentheses. Only the mean differences that are significant at the 0.05 level are displayed.

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lower scores than a majority of the other regions. According to the multiple comparison analysis, the mean scores of Regions 1, 2, 4, 5, and 7 are not surpassed by any other region; and the differences between these regions are not significant.

This study will not attempt to investigate why these regional disparities exist, but a partial explanation can be suggested for future research. The relative advantage of Region 4 (Covington/ Newport/Dayton, etc.) and Region 5 (Lexington/Frankfort/Winchester, etc.) could be owing to the high proportion of metropolitan (especially suburban) schools. Region 3 (Louisville/Jefferson Co., etc.) is totally metropolitan but many of its schools are also inner-city. This difference may be sufficient to account for the lower average score in Region 3 compared with Region 4 and Region 5. The lower performance of schools in Region 6 (Richmond/London/Williamsburg, etc.) and Region 8 (Pikeville/Hazard/Prestonsburg, etc.) require an alternative explanation. These regions have the highest proportion of rural schools in the State. These are also the regions with the lowest high school graduation rates and the lowest median household incomes (Reeves, 1998).

The above comparisons used the school Academic Index scores averaged by region, from 1992-93 to 1996-97. A different way to compare the regions over the same years is to look at changes in scores that indicate differences in the mean or average amount of gain. This is especially pertinent for determining if a "widening gap" between the regions is actually coming about. As stated previously, two approaches were used to address this issue. The first approach was to calculate the simple mean difference in scores between the first and the fifth year. The second approach calculated the difference between the average score of the first two years and the average score of the last two years. Using these two approaches and the multiple comparison

analysis produced strikingly different results.[8]

Following the first approach (TABLE 4, upper figures), Region 3 and Region 6 were found to have fallen behind Region 2. But it is Region 8 that has fared least well according to the findings of the first approach. The gains of this region lag behind the gains of Region 1, Region 2, Region 4, and Region 5. On the other hand, significant differences were not found between the gains of Region 1, Region 2, Region 4, Region 5, and Region 7. These results support Mr. Bishop's argument (1998a, 1998c) that regional disparities exist and Region 8 in particular is falling behind other regions. A different conclusion emerges when the second approach to calculating the 5-year gain is used, however.

Using the second approach (TABLE 4, lower figures), Region 3 was discovered to have experienced a shortfall in improving its scores compared with Region 1 and Region 2. The scores of the remaining pairs of regions were not sufficiently different to attain statistical significance. As explained above, the authors believe that this second approach to calculating the change in the scores moderates the exaggerations to which the first approach is subject and offers more reliable results. According to the second approach, the "mountain schools" of Region 8 are *not* falling behind the rest of the State, as Mr. Bishop has contended. Nevertheless, Bishop is right to be concerned about the possibility of increasing disparity between the regions. This concern is a good reason to continue regular monitoring of the regional Academic Index scores.

Discussion

Performance-based educational reform--holding schools accountable for what students

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[8]As before, the statistical test for pairwise multiple comparison was Tamhane's T2.

TABLE 4

COMPARISONS OF AVERAGE REGIONAL DIFFERENCES IN THE CHANGE IN SCHOOL ACADEMIC INDEX SCORES FROM 1992-93 TO 1996-97

Regions of the State	Region #1	Region #2	Region #3	Region #4	Region #5	Region #6	Region #7	Region #8
Region #1	---	---	---	---	---	---	---	3.7
(Paducah Henderson Murray, etc.)	---	---	2.2	---	---	---	---	---
Region #2	---	---	3.4	---	---	3.2	---	4.5
(Bowling Green Owensboro Elizabethtown, etc.)	---	---	2.8	---	---	---	---	---
Region #3	---	(-3.4)	---	---	---	---	---	---
(Louisville Jefferson Co., etc.)	(-2.2)	(-2.8)	---	---	---	---	---	---
Region #4	---	---	---	---	---	---	---	3.5
(Covington Newport Dayton, etc.)	---	---	---	---	---	---	---	---
Region #5	---	---	---	---	---	---	---	2.7
(Lexington Frankfort Winchester, etc.)	---	---	---	---	---	---	---	---
Region #6	---	(-3.2)	---	---	---	---	---	---
(Richmond London Williamsburg, etc.)	---	---	---	---	---	---	---	---
Region #7	---	---	---	---	---	---	---	---
(Ashland Maysville Morehead, etc.)	---	---	---	---	---	---	---	---
Region #8	(-3.7)	(-4.5)	---	(-3.5)	(-2.7)	---	---	---
(Pikeville Hazard Prestonsburg, etc.)	---	---	---	---	---	---	---	---

NOTE: ***For each comparison above, the upper figure is the simple mean difference in scores, from 1992-93 to 1996-97. The lower figure is a mean difference obtained by subtracting the average of the first two years from the average of the last two years. For emphasis negative figures are enclosed by parentheses. Only the mean differences that are significant at the 0.05 level are displayed.***

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learn--is a nationwide issue (Ladd, 1996; Nelson, 1998). Kentucky has achieved national prominence because of its highly innovative and comprehensive reform program (Elmore, Abelmann, & Fuhrman, 1996; Guskey, 1994). The Kentucky Supreme Court decision issued in June of 1989, which led to the Kentucky Educational Reform Act of 1990, called for "an efficient system of common schools" (Miller, Noland, & Schaaf, 1990: ix, 2). Among other things, the characteristics of such an educational system would include: schools that are "substantially uniform throughout the State" and the provision of "equal educational opportunities to all Kentucky children." Monitoring regional differences in the performance of schools is a useful way to assess if these goals are being met. It can help point out if the schools are providing an education that is "substantially uniform throughout the State." Moreover, it shows indirectly the degree to which "equal educational opportunity" is being realized across the several regions.

A consequence of this inquiry into regional disparities is that it forces one to be more precise about what uniformity and equal educational opportunity really mean. If these terms mean that test scores should be substantially uniform across the State and between the regions, then according to the results of the present study KERA has not succeeded. The comparisons of regional mean scores (TABLE 2 and TABLE 3) clearly show that significant differences between the regions exist. It is quite likely that these differences reflect contextual influences on education, including the historical circumstances to which Mr. Bishop refers (Bishop, 1998a; Bishop, 1998b; also Reeves, 1998).

But if by "substantial uniformity" and "equal opportunity" one implies instead that constraints on the ability of schools to improve children's performance should be kept to a minimum, the results obtained above (especially in TABLE 4, lower figures) are less pessimistic.

The evidence is that all regions are improving and most are keeping pace with one another. It would be preferable if lower scoring regions, such as Region 6 (Richmond/London/Williamsburg, etc.) and Region 8 (Pikeville/Hazard/Prestonsburg, etc.), could eventually gain on higher scoring regions, such as Region 4 (Covington/Newport/Dayton, etc.) and Region 5 (Lexington/Frankfort/Winchester, etc.). This is a goal that should be pursued diligently by the State.

Based on five years of data, greater educational equality remains an unrealized ideal under KERA. Still, gains have been made in all of the Service Center Regions with little evidence thus far of a widening gap between the higher- and lower-scoring regions. Another five years of data should tell if a widening gap between the regions has become a persistent problem.

Conclusions

Based on the stated assumptions, identified limitations, and the displayed and discussed findings, an analysis of the data in response to the issues raised permits the following conclusions to be drawn:

- Based on the analysis of 5 years of Academic Index scores, regional disparities persist under KERA. Schools in some regions of the State have higher performing students than do schools in other regions.
- Lower scores are found in regions where there are a large number of inner-city schools, and where there are numerous rural schools and populations of a low socioeconomic status.
- Most regions had similar gains or improvement in their test scores over the five-year period. Therefore, evidence that would confirm a "widening gap" between the regions is limited at this point in time.

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